

FINE MINERAL FIBERS

Fine mineral fibers are federal hazardous air pollutants and were identified as toxic air contaminants in April 1993 under AB 2728.

CAS Registry Number: N/A

Molecular Formulas: SiO_2 , Na_2O , TiO_2 , B_2O_3

Fine mineral fibers, as defined by Congress in the 1990 Clean Air Act Amendments, includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer (μm) or less. 42 U.S.C. § 7412(b)(1)n.3. (Previous definitions defined ‘mineral fibers’ as having a respirable size ($\leq 3.5 \mu\text{m}$) and a length to diameter ratio greater than or equal to 3:1.) Facilities manufacturing or processing fibers less than 1 μm primarily use glasswool. The term “wool” is used to describe glassy fibers that have been attenuated without the use of a nozzle. Fine mineral fibers have high tensile strength, dimensional stability, high heat resistance, resistance to chemical attack, high thermal conductivity, low moisture absorption, high dielectric strength, and flame resistance. They are composed mainly of borosilicate but can also incorporate other mineral oxides and have a pearly, white luster. (IARC, 1988a).

Physical Properties of Fine Mineral Fibers

Synonyms: Ultra-fine glasswool; fine glasswool, special purpose fibers

Density:	approx 2.568 g/cm ³
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Refractive Index:	approx 1.537
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(WHO, 1988a)

SOURCES AND EMISSIONS

A. Sources

Special purpose fibers (a larger set of fibers than fine mineral fibers), defined as those with nominal diameters from 0.1 - 3 μm , account for less than 1 percent of worldwide man-made fiber production. Fine mineral fibers ($<1 \mu\text{m}$) are used for specialized purposes such as high performance filtration products (Hill, 1977), aircraft insulation (Kilburn, 1982), and battery applications (NAIMA, 1996). Fine mineral fibers are generally not used in home, commercial, and industrial insulation products that are commonly found in many United States buildings.

The primary stationary sources that have reported emissions of fine mineral fibers in California, under the Air Toxics “Hot Spots” Program (AB 2588), are crude petroleum and natural gas extraction, manufacturers of aircraft and parts, and electrical services (ARB, 1997b).

B. Emissions

The total emissions of mineral fibers from stationary sources in California are estimated to be at least 145 pounds per year, based on data reported under the “Hot Spots” Program (AB 2588) (ARB, 1997b). However, the data collected under this program reflects airborne particles greater than 5 μm in length, less than or equal to 3.5 μm in diameter, and with a length to diameter ratio greater than or equal to 3:1. The emissions applicable to the statutory definition of fine mineral fibers are likely to be significantly less.

C. Natural Occurrence

No information about the natural occurrence of fine mineral fibers was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of fine mineral fibers.

INDOOR SOURCES AND CONCENTRATIONS

No information about indoor sources and concentrations of fine mineral fibers was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Fine mineral fibers exist in the particle phase in the atmosphere, and hence are subject to wet and dry deposition. The average half-life and lifetime for particles in the troposphere is estimated to be about 5-15 days (Atkinson, 1995; Balkanski et al., 1993).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics “Hot Spots” Program (AB 2588). Of the risk assessments reviewed as of April 1995, fine mineral fibers were not listed in any of the risk assessments (OEHHA, 1995).

HEALTH EFFECTS

Probable routes of human exposure to fine mineral fibers are inhalation, ingestion, and dermal contact.

Non-Cancer: Glass mineral fibers with diameters less than 3.5 μm have not been associated with adverse health effects in humans but glass fibers of this dimension have only been regularly produced since the 1960's. These smaller diameter fibers (including fine mineral fibers) have the ability to penetrate to the alveoli (Sittig, 1991). Two epidemiological investigations have shown no relationship of occupational exposure to adverse clinical signs or mortality, although the prevalence of small opacities in the lungs of exposed workers was increased in one study (Hughes et al., 1993; Marsh et al., 1985). No information is available on the developmental or reproductive effects of fine mineral fibers in humans or animals.

Cancer: No information is available on cancer effects in humans or animals. The United States Environmental Protection Agency has not classified fine mineral fibers as to their carcinogenicity (U.S. EPA, 1993g). The International Agency for Research on Cancer has classified mineral fibers of respirable size (glasswool, rockwool, slagwool, and ceramic fibers) in Group 2B: Possibly carcinogenic to humans (IARC, 1988a). The State of California has determined under Proposition 65 that glasswool and ceramic fibers (of respirable size particles) are carcinogens (CCR, 1997).

